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(71) Applicant *(for all designated States except US)*: ELGEMS LTD. [IL/IL]; P.O. Box 170, 30200 Tirat Hacarmel (IL).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: BAR-SHALEV, Avi [IL/IL]; 10 Lavie Street, 26261 Kiryat-Haim (IL).

(74) Agents: FENSTER, Paul et al.; Fenster & Company Patent Attorneys, Ltd., P.O. Box 10256, 49002 Petach Tikva (IL).

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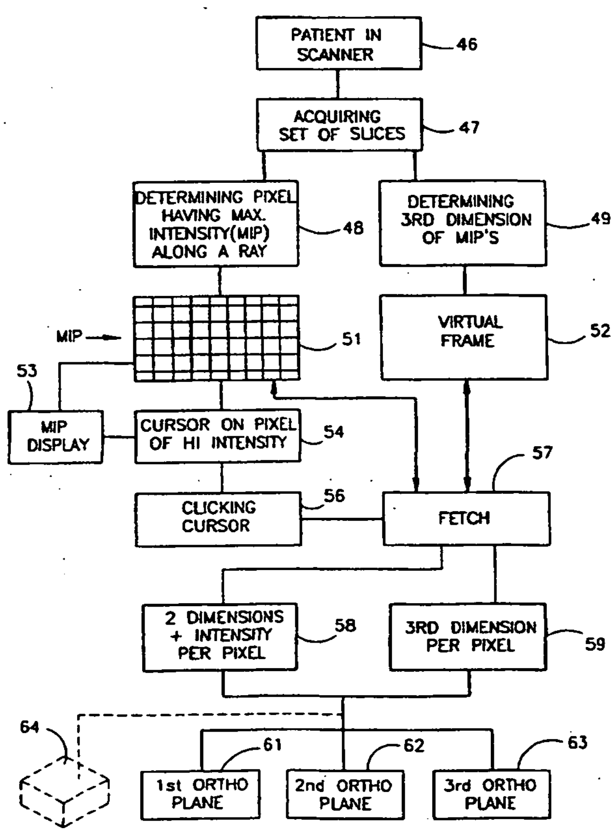
(54) Title: IMAGE NAVIGATION



(57) Abstract: A method of using a frame of pixels of a specified characteristic such as a maximal intensity projected frame and a depth location "virtual" frame to locate and image ROI's in patients.

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IMAGE NAVIGATION

FIELD OF THE INVENTION

This invention relates generally to single proton emission computerized tomography (SPECT) and more particularly to apparatus and methods for locating and displaying various regions of interest (ROI) within the patient being subjected to computerized tomographic imaging.

BACKGROUND OF THE INVENTION

SPECT imaging produces two-dimensional tomograms; that is, planar images of the body that are generally oriented either in an axial direction, coronal direction or a sagittal direction. In applying imaging methods, it is well-known to acquire images of multiple slices in the body. This is done either by helical scanning or by individual circular scans while moving the patient step-by-step relative to the scanner.

At the present time, in order to locate a particular ROI in three dimensions in the body, such as one containing a lesion, it is necessary for the radiologist or physician to inspect the many parallel images that have been acquired. For example, in a whole body scan it is not unusual to acquire as many as 200 parallel images having one or more of axial, coronal or sagittal orientations. The physician or radiologist in charge of the examination then studies each of the 200 images to determine the location of the lesion in the body. When the location of the lesion is determined, then more detailed scans are undertaken to provide maximum information about the lesion. For example, if the lesion is discovered in an image in the axial plane, then the operator of the equipment will acquire sagittal and coronal, as well as more axial images in the region of interest, to further examine the lesion, for surgical planning, for example. To discover specific lesions, the physician or radiologist in charge of examination must look for "hot" spots that are on the order of one square centimeter, a very time-consuming job.

At the present time, some of the ways used to lessen the burden of reviewing the large group or set of images of slices include cinematic displays of the slice set, and/or a cinematic display of a volume rendered as a 3-D presentation. When using the first of these prior art solutions, the user has to concentrate on the moving presentation in which only one slice is activated at a time. When a lesion is detected, the viewer has to immediately stop the cinematic display and use a cursor to point to the lesion. Then, additional images are taken at the point that the cursor is positioned.

When cinematic volumetric images are displayed, according to the second prior art solution, the display gathers into one view the 3-D information of the slices. Here again, when

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the lesion is found the viewer has to immediately pause the movie and point to the lesion with the cursor. Then, additional views are taken at the cursor location. These prior art solutions often require additional viewing to locate a lesion.

Maximum intensity projection (MIP) are known in the prior art. It is a commonly used technique in imaging for such things as for displaying 3-D vascular image data. For example, see U.S. Patent 5,570,404 the disclosure of which is hereby included herein by reference. In that patent, the MIP is used for removing undesirable structures from a series of parallel images. As noted in the patent, the MIP frame is developed from a stack of acquired parallel images. The MIP frame contains pixels, wherein each pixel holds the maximum intensity along a ray perpendicular to the MIP frame. The patent does not use the MIP for locational purposes. Exemplary embodiments of the present invention use MIP's for locating regions of interest in a patient being imaged, for example, for locating lesions in the patient.

SUMMARY OF THE INVENTION

An aspect of some embodiments of the invention relates to a method for expeditiously locating and displaying particular regions of interest in a patient or object being imaged.

In exemplary embodiments of the invention, a projection "characteristic" image is generated from a stack of images. Associated with each pixel is depth information which defines the depth (or image number) in the stack that includes the characteristic. A user can then indicate the pixel or pixel area that is of interest on the projection image, without having to look through all the images in the stack.

In some embodiments of the invention, the depth information associated with the pixel is used to call up the image whose pixel value was used in the projection image and display that image (and, optionally, images of one or more nearly slices) and optionally sets of images that pass through (and, optionally close to) the pixel and are orthogonal to the stack of images.

There is thus provided, in accordance with an exemplary embodiment of the invention, a method of locating a region of interest (ROI) within a patient from a plurality of parallel frames of two-dimensional intensity data, comprising:

assembling at least one group of said plurality of parallel frames;

generating a two-dimensional projected frame of pixels of a specified characteristic for the parallel frames of the group;

determining third dimensional data for each pixel in the group, said third dimension comprising the depth of a frame having the specified characteristic for each pixel in the projected frame; and

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locating the ROI by selecting a pixel in the two-dimensional projected frame.

In an exemplary embodiment, the specified characteristic is the maximal intensity projected (MIP), and the two-dimensional projected frame is an MIP frame.

Optionally, the specified characteristic is a function of the maximal intensity projected.

In some embodiments of the invention, selecting the pixel in the two-dimensional frame comprises selecting a pixel having the highest intensity. Alternatively or additionally, selecting the pixel in the two-dimensional frame comprises selecting a pixel that contains a function of the specified characteristic. Alternatively, selecting the pixel in the projected frame comprises selecting a pixel from among a group of pixels with higher than average intensities.

In some embodiments of the invention, the method includes:

determining the three dimensions and the intensities of pixels with higher than average intensities in the region of the selected pixel; and

displaying the ROI using the determined three dimensions and intensities of the pixels in the region of the selected pixel.

In some embodiments of the invention, determining comprises determining by an imager on which the parallel frames are acquired. Alternatively or additionally, determining includes manually determining.

In some embodiments the method includes:

storing the third dimensional data;

locating a cursor on the selected pixel in the projected image suspected of indicating an ROI;

clicking on the cursor located on the pixel in the projected image;

fetching the data of the two dimensions and intensity from pixels in the vicinity of the cursor located in the projection frame and the stored third dimensional data responsive to the click on the cursor; and

generating images using the fetched data.

In some embodiments, the images generated using fetched data are orthogonal images. Alternatively or additionally, the images generated using the fetched data are 3-dimensional images.

Optionally, the region of interest is a lesion and wherein the cursor is located on a hot spot in the projected image suspected of indicating a lesion.

In some embodiments, the method includes:

causing the patient to ingest a radionuclide; and

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acquiring the plurality of parallel frames using a gantry including gamma radiation detectors for detecting the gamma radiation emitted by the patient after ingesting the radionuclide.

In some embodiments, the gantry causes gamma radiation detectors to perform a helical scan of the patient. Alternatively, the gantry causes the gamma ray detectors to perform a plurality of orbital scans. Alternatively, the gantry causes the detectors to perform an orbital scan that is non- circular, maintaining the detectors in close proximity to the patient during the orbital scan.

The parallel frames may be coronal views, sagittal views, axial views or oblique views.

In some embodiments of the invention, storing of the third dimensional data comprises storing the data in a virtual frame. Optionally, storing third dimensional data in the virtual frame at the two dimensions that locate the maximum intensity pixel of each of the pixels of the projected frame.

In exemplary embodiments of the invention, the frames are PET images, SPECT images or STET images.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the invention are described in the following description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a schematic block diagram showing an exemplary ECT system for carrying out the invention;

Fig. 2 shows a schematic illustration of a helical whole-body scan;

Fig. 3 is a flow chart showing a method according to an exemplary embodiment of the invention;

Fig. 4A is a collection of images of slices in the axial direction;

Fig. 4B is a collection of images of slices in the coronal direction;

Fig. 4C is a collection of images of slices in the sagittal direction;

Fig. 5 is a two-dimensional coronal MIP frame produced in accordance with an embodiment of the invention;

Fig. 6 is a virtual frame that defines a third dimension for each of the pixels of the MIP frames in accordance with an embodiment of the invention; and

Figs. 7A-C show axial, coronal, and sagittal planes acquired by clicking on the coronal MIP frame of Fig. 5, in accordance with an embodiment of the invention.

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DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

A SPECT system, also sometimes referred to as an emission computerized tomographic (ECT) system 21 of Fig. 1 includes a gantry 22 on which are mounted detectors, such as first detector head 23 and an oppositely-disposed second detector head 24. Within the scope of the invention a single detector head or more than two detector heads can be used. Equipment such as this is well-known in gamma camera nuclear medicine imaging field. It is described in detail in U.S. Patent 5,554,848, the disclosure of which is incorporated herein by reference. Detector heads 23 and 24 are mounted, spaced apart from each other, with room therebetween for the insertion for a patient table 26, which may be mounted on its own mobile base 27. Gantry 22 is shown as including a non-rotating stationary gantry base 25. In the ECT system of Fig. 1, the gantry rotates the detector heads about a central axis 32. The rotation may be accomplished by any well-known means, such as a motor 33A operated in conjunction with gears 34 and 35. The rotating gantry causes detector heads 23 and 24 to rotate about a patient shown at 36. Detector heads 23 and 24 are capable of moving towards and away from the patient through the use of such apparatus as a motor 38 cooperating with gear arrangements 39 and 40. Motor 38, along with gears arrangements 39 and 40 are used to maintain the detector heads proximate to the patient at all times. Thus, the detector heads are maintained juxtaposed to the patient in a non-circular orbit.

To provide a helical scan about patient 36 as demonstrated in Fig. 2, means are provided for moving table 26 and scanners 32 relative to each other. Thus, one arrangement providing relative motion is shown in Fig. 1 as a motor 31, operating in conjunction with a gear box 30 to move table 26 relative to gantry 22. The motor and gear arrangement rotates wheels such as a wheel 33, moving table 26 along a rail 29.

Within the scope of the invention, the scan does not have to be helical. It can be a plurality of separate orbital scans made while there is no relative longitudinal motion between the patient and the scanner; in which case the bed is moved relative to the scanner in steps prior to each rotation of the scanner about the patient. Furthermore, while the scanner shown in Fig. 1 is of the SPECT type, the invention is equally applicable to other 3-D imaging systems such as STET, PET, etc. Furthermore, other constructions of imaging systems known in the art are useful in the practice of the invention, it being understood that the apparatus shown and described in the figures is purely exemplary.

Detector heads 23 and 24 detect emitted gamma rays, for example. The gamma rays strike the detectors, which include scintillators which scintillate in response to the impact of the gamma rays. Photo-multiplier tubes are included in the detectors, and convert the light

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flashes of the scintillators into electrical signals, in the well-known manner of gamma radiation nuclear medicine imaging. The electrical signals are sometimes referred to as beta signals. The beta signals are transmitted by conductors such as conductors 41, 42 to a control processor 37. The control processor converts the beta signals into images in a well-known manner. The image thus provided is displayed on the image or display monitor 43.

The flow diagram of Fig. 3 outlines a method for determining the 3-D position of a lesion (hot spot) in accordance with an exemplary embodiment of the invention. The method, in block 46, calls for positioning the patient or object in a scanner such as scanner 21. The scanner is then operated to acquire a set or group of images of slices, as indicated in block 47.

From a stacking of the group of slices, the maximum intensity pixel is determined in straight line rays or projections perpendicular to the stack of slices and going through all of the pixels similarly placed in each slice. The maximum intensity pixel two-dimensional location and intensity for each ray is determined and posted in an MIP frame. The determination of the MIP frame is shown in block 48.

While finding the maximum intensity pixel along each ray, a determination is also made of the third dimension location of each of the maximum intensity pixels for each pixel in the MIP frame. The determination of the third dimension of each of those pixels is shown in block 49.

From the determination of the maximum intensity pixels, a two-dimensional maximum intensity projection (MIP) frame 51 is assembled, based on the first and second dimensions, and locations of each of the maximum intensity pixels in the MIP frame. This frame can be considered as a projection image of the stack, with the highest value in the projection shown. At the same time, the third dimension of each of the pixels that have the maximum intensity along each ray is stored in a virtual frame 52. Thus, for example, if frame 51 is defined by X and Y coordinates, then for each of the X and Y coordinates frame 52 would provide a Z value, or a depth measurement of the position in the Z direction of the highest value pixel.

The MIP frame assures that it is relatively easy to determine a lesion, since a lesion is hot, and therefore brighter than surrounding pixels; i.e., the pixels of the lesion are brighter than surrounding pixels. The MIP frame is displayed on the monitor as indicated in block 53. The position of the lesion on the MIP frame is determined either automatically or by the operator. For example, in accordance with an exemplary embodiment of the invention a cursor is placed somewhere on the lesion, as indicated by block 54. The cursor on the lesion is clicked, as shown in block 56. This, according to an embodiment of the invention, initiates a fetch command. The fetch command indicated by block 57 assembles both the two-

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dimensional locational values, as shown in block 58 and the third dimension of the virtual frame shown in block 59, plus optionally the intensity of the pixel that the cursor is on.

With this information, three orthogonal planes can be displayed, as shown at blocks 61 for example for the sagittal frame, 62 for the coronal frame and 63 for the axial frame. Preferably each of these images contain the lesion. This enables an automatic display of the lesion in the three orthogonal planes, or a three-dimensional image shown in dashed lines at 64 can be easily developed with the information at hand. Alternatively, any one or two orthogonal slices containing the lesion are shown. Alternatively or additionally, several slices around the lesion are shown (for example in a cine mode or side-by-side) to provide a view of the entire lesion and its surroundings.

Fig. 4A shows a group of axial slices, while Fig. 4B shows a group of coronal slices, and Fig. 4C shows a group of sagittal slices. In each figure the slices are arranged side by side as they would be on a standard display or hard copy. Bright spots indicated in the slices are caused by the lesions.

The lesion is more clearly depicted in Fig. 5, a coronal MIP. It would also be shown in the sagittal MIP, or an axial MIP.

If a cursor is placed on the lesion, as indicated by the origin of arrow 66 in Fig. 5, the coronal MIP, and the cursor is clicked, then the computer provides fetch commands to fetch the data necessary for providing orthogonal images.

Fig. 6 shows a frame used for storage of depth information for each of the maximum-intensity pixels depicted in the MIP. Thus, for example, if the virtual frame of Fig. 6 is an X-Z frame, then Y values will be stored at the X-Z locations, so that when an X-Z location from an MIP is known, the depth value Y is immediately called out in the virtual frame of Fig. 6.

The virtual frame does not need to be displayed. While a frame type memory is shown, other type memories can be used within the scope of the invention. Finally, Fig. 7A shows the three orthogonal images 7A, 7B and 7C, automatically provided for example by clicking on the lesion. Three orthogonal views at the origin of arrow 66 provides a 3-D location, as emphasized with the hot circle in each of the axial (Fig. 7A), coronal (Fig. 7B) and sagittal (Fig. 7C) images. More particularly, the circles are shown at 67, 68 and 69, in Figs 7A, 7B and 7C. Thus, by determining the third dimension at the same time as determining the first and second dimension of the pixel having the maximum intensity, it becomes possible to simultaneously create MIP and third dimension frames. The addition of a user interface, as shown in Fig. 1, which senses a mouse click and responds to the mouse click with a "fetch" command enables the display of the region of interest; i.e., the lesion indicated by a selected

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pixel of the MIP frame Thus, the necessity of reviewing up to 200 images of the group of images is eliminated.

It should be apparent that the embodiment described herein is merely exemplary, and that a person skilled in the art may make many variations and modifications to the embodiments as described herein. In particular, other devices than those shown, such as solid state gamma cameras, may be used to acquire the images or to process them and other methods may be used to prepare the image for display. Any and all such variations or modifications, as well as others, which may become apparent to those skilled in the art, are intended to be included within the scope of the invention as defined by the appended claims.

The terms "include", "comprise" and "have" and their conjugates, as used herein mean "including but not necessarily limited to."

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CLAIMS

1. A method of locating a region of interest (ROI) within a patient from a plurality of parallel frames of two-dimensional intensity data, comprising:

assembling at least one group of said plurality of parallel frames;

generating a two-dimensional projected frame of pixels of a specified characteristic for the parallel frames of the group;

determining third dimensional data for each pixel in the group, said third dimension comprising the depth of a frame having the specified characteristic for each pixel in the projected frame; and

locating the ROI by selecting a pixel in the two-dimensional projected frame.

2. The method of claim 1 wherein the specified characteristic is the maximal intensity projected (MIP), and the two-dimensional projected frame is an MIP frame.

3. The method of claim 1 wherein the specified characteristic is a function of the maximal intensity projected (MIP).

4. The method of any of claims 1-3 wherein selecting the pixel in the two-dimensional frame comprises selecting a pixel having the highest intensity.

5. The method of any of claims 1-3 wherein selecting the pixel in the two-dimensional frame comprises selecting a pixel that contains a function of the specified characteristic.

6. The method of any of claims 1-5 wherein selecting the pixel in the projected frame comprises selecting a pixel from among a group of pixels with higher than average intensities.

7. The method of any of claims 1-6, including:

determining the three dimensions and the intensities of pixels with higher than average intensities in the region of the selected pixel; and

displaying the ROI using the determined three dimensions and intensities of the pixels in the region of the selected pixel.

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8. The method of any of the preceding claims wherein determining comprises determining by an imager on which the parallel frames are acquired.

9. The method of any of the preceding claims wherein determining includes manually determining.

10. The method of any of claims 1-9, including:

storing the third dimensional data;

locating a cursor on the selected pixel in the projected image suspected of indicating an ROI;

clicking on the cursor located on the pixel in the projected image;

fetching the data of the two dimensions and intensity from pixels in the vicinity of the cursor located in the projection frame and the stored third dimensional data responsive to the click on the cursor; and

generating images using the fetched data.

11. The method of claim 10 wherein said images generated using fetched data are orthogonal images.

12. The method of claim 10 wherein the images generated using the fetched data are 3-dimensional images.

13. The method of any of the preceding claims wherein the region of interest is a lesion and wherein the cursor is located on a hot spot in the projected image suspected of indicating a lesion.

14. The method of any of claims 1-13 including:

causing the patient to ingest a radionuclide; and

acquiring the plurality of parallel frames using a gantry including gamma radiation detectors for detecting the gamma radiation emitted by the patient after ingesting the radionuclide.

15. The method of claim 14 wherein the gantry causes gamma radiation detectors to perform a helical scan of the patient.

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16. The method of claim 14 wherein the gantry causes the gamma ray detectors to perform a plurality of orbital scans.

17. The method of claim 14 wherein the gantry causes the detectors to perform an orbital scan that is non- circular, maintaining the detectors in close proximity to the patient during the orbital scan.

18. The method of any of claims 1-17 wherein the parallel frames are coronal views.

19. The method of any of claims 1-17 wherein the parallel frames are sagittal views.

20. The method of any of claims 1-17 wherein the parallel frames are axial views.

21. The method of any of claims 1-17 wherein the parallel frames are oblique views.

22. The method of any of the preceding claims wherein the storing of the third dimensional data comprises storing the data in a virtual frame.

23. The method of claim 22, including storing third dimensional data in the virtual frame at the two dimensions that locate the maximum intensity pixel of each of the pixels of the projected frame.

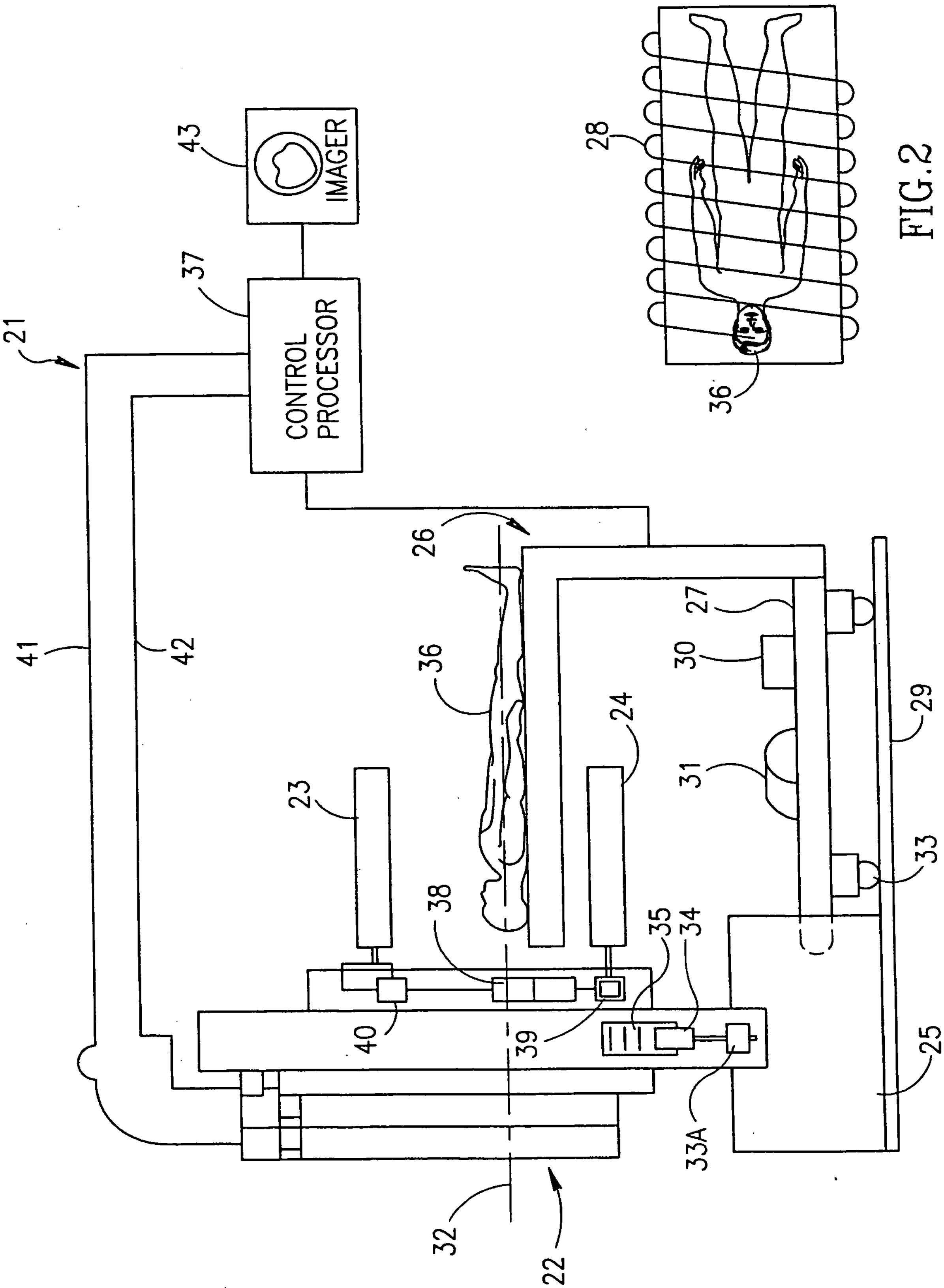
24. The method of any of the preceding claims wherein the frames are PET images.

25. The method of any of the preceding claims wherein the frames are SPECT images.

26. The method of any of the preceding claims wherein the images are STET images.

BNSDOCID: <WO___0126052A1_I_>

1/4


IMAGER
CONTROL PROCESSOR
21
22
23
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33A
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39
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41
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43
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FIG.1

FIG.2

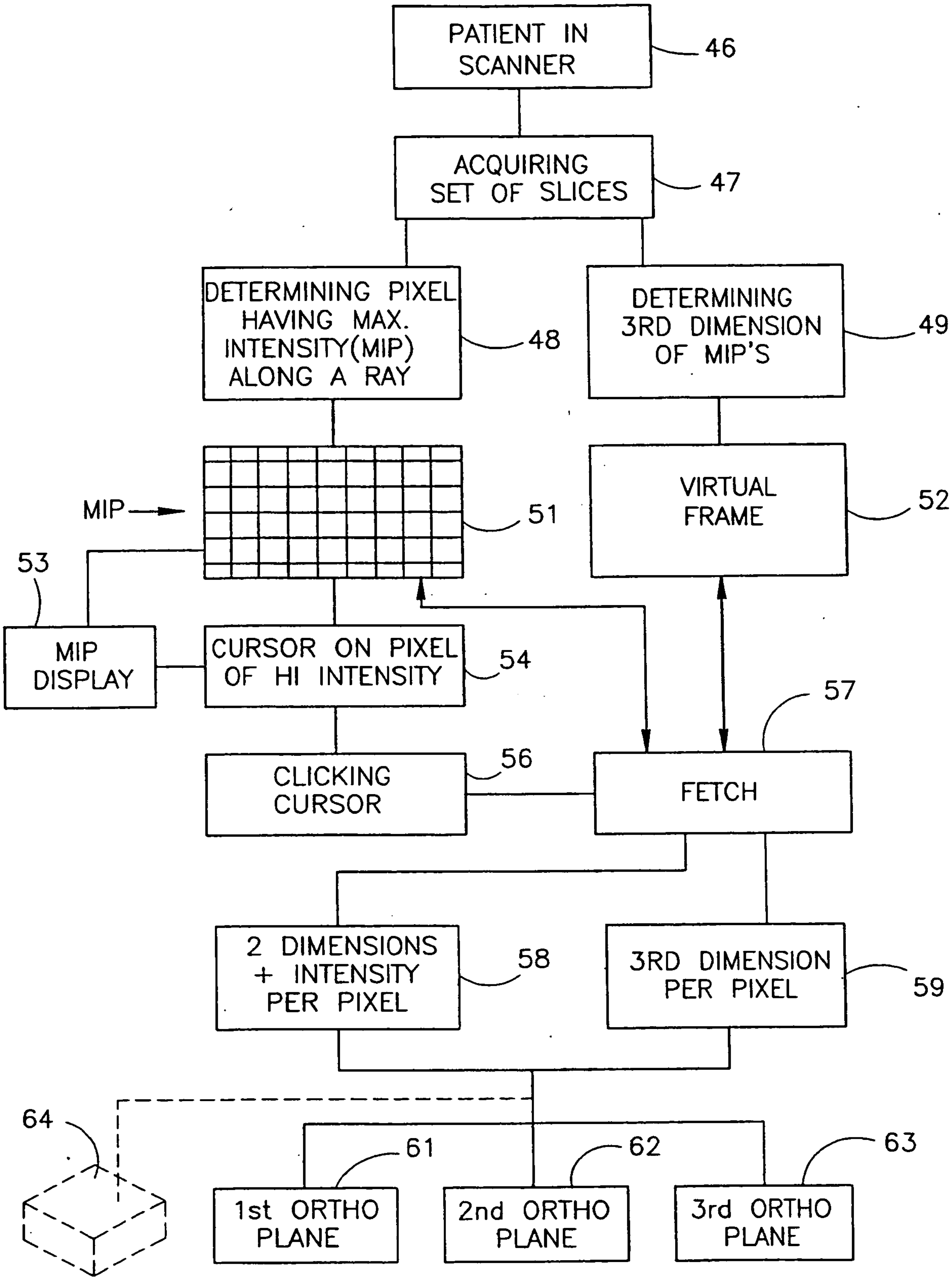
PATIENT IN SCANNER
46
ACQUIRING SET OF SLICES
47
DETERMINING PIXEL HAVING MAX. INTENSITY(MIP) ALONG A RAY
48
DETERMINING 3RD DIMENSION OF MIP'S
49
MIP
51
VIRTUAL FRAME
52
53
MIP DISPLAY
CURSOR ON PIXEL OF HI INTENSITY
54
57
CLICKING CURSOR
56
FETCH
2 DIMENSIONS + INTENSITY PER PIXEL
58
3RD DIMENSION PER PIXEL
59
64
61
62
63
1st ORTHO PLANE
2nd ORTHO PLANE
3rd ORTHO PLANE

FIG.3

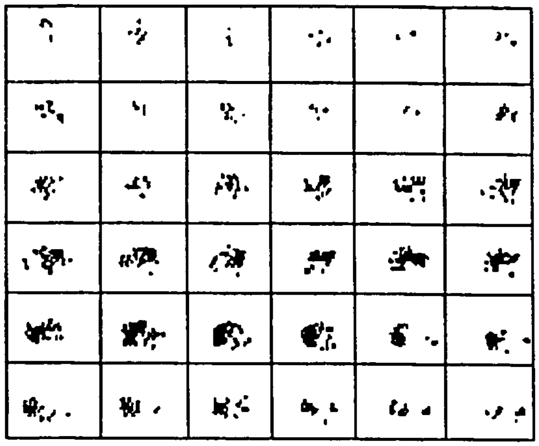

FIG.4A

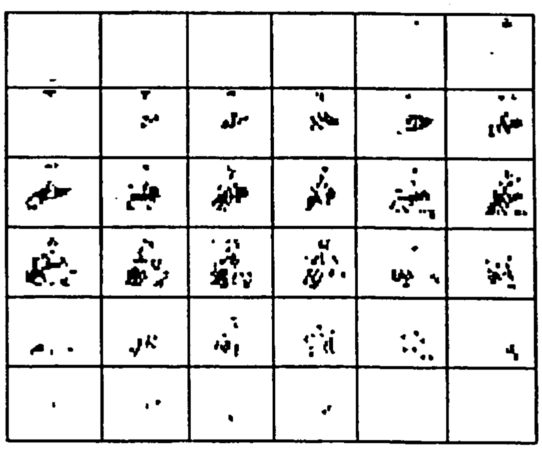

FIG.4B

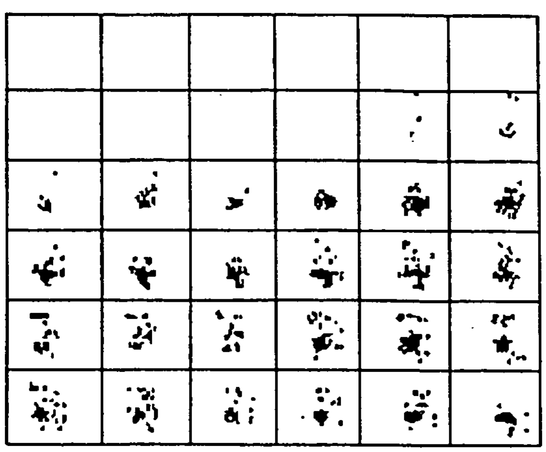

FIG.4C

4/4

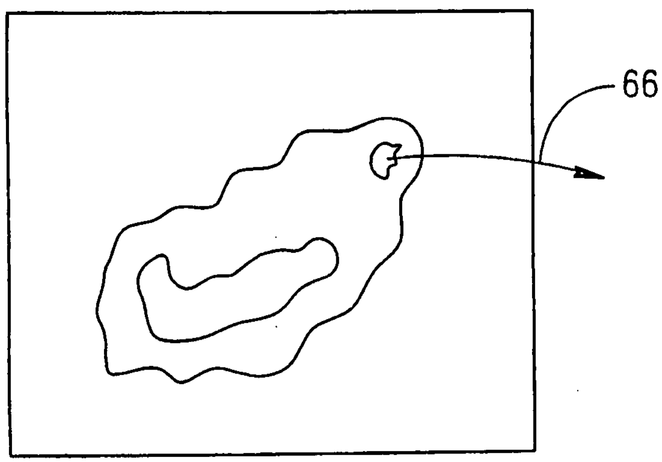

FIG.5

1st DIMENSION FROM MIP FRAME

3rd DIMENSION OF MIP'S

D_5	D_7	D_6	D_5	D_4	D_8	D_7
D_4	D_6	D_{10}	D_7	D_7	D_{10}	D_5
D_3	D_6	D_{12}	D_8	D_7	D_5	D_8
D_{11}	D_{10}	D_6	D_{11}	D_8	D_5	D_3
D_7	D_9	D_5	D_4	D_7	D_{10}	D_{11}
D_8	D_7	D_9	D_4	D_5	D_6	D_8

2nd DIMENSION FROM MIP FRAME

FIG.6

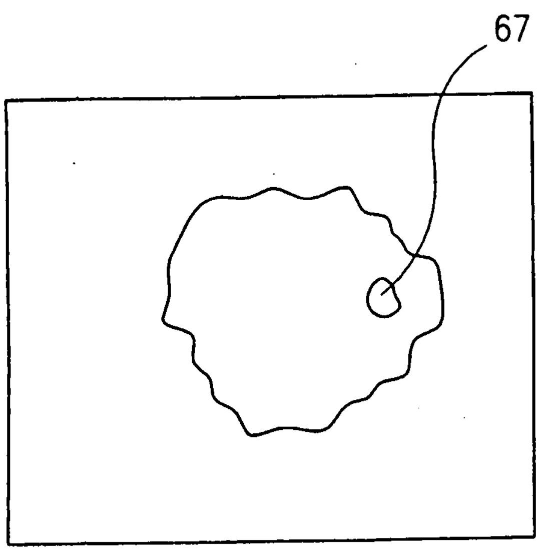

FIG.7A

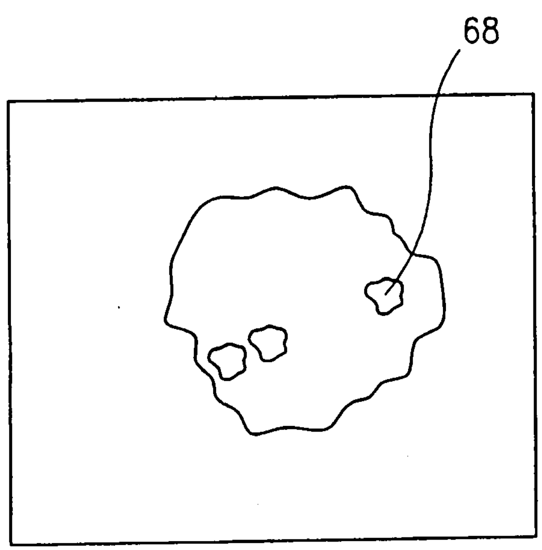

FIG.7B

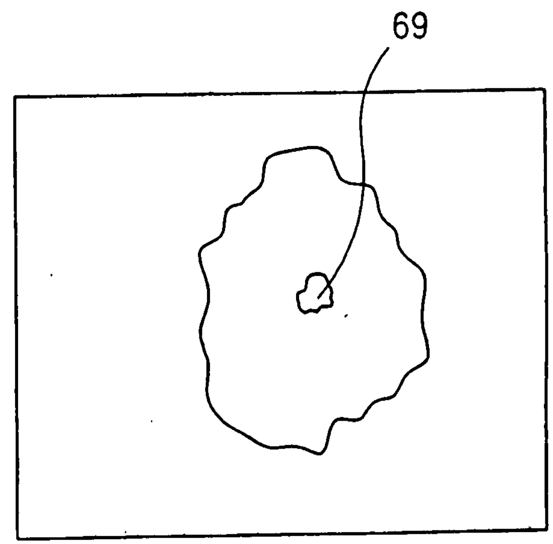

FIG.7C

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IL 00/00578

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06T5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 570 404 A (LIANG CHENG-CHUNG ET AL) 29 October 1996 (1996-10-29) abstract column 1, line 26 - line 37 column 2, line 59 -column 3, line 32	1-26
Y	US 5 793 375 A (TANAKA YUKO) 11 August 1998 (1998-08-11) abstract column 2, line 60 -column 3, line 26	1-26
A	US 5 832 134 A (ALYASSIN ABDALMAJEID MUSA ET AL) 3 November 1998 (1998-11-03) abstract column 3, line 43 - line 54 column 4, line 30 - line 39 column 4, line 64 - line 68	1-26

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
2 February 2001	09/02/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Gonzalez Ordonez, O

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INTERNATIONAL SEARCH REPORT

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PCT/IL 00/00578

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5570404 A	29-10-1996	NONE	
US 5793375 A	11-08-1998	JP 8138078 A	31-05-1996
US 5832134 A	03-11-1998	DE 19746938 A	28-05-1998
		JP 10232928 A	02-09-1998

BNSDOCID: <WO___0126052A1_I_>

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